

The effect of parigi pineapple (*Ananas Sp.*) juice consumption on LDL cholesterol level in students of medical faculty, university of Palangka Raya

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ABSTRACT

Background & aims: Excessive consumption of cholesterol could increase the cholesterol level in the blood which is recognized as hypercholesterolemia. LDL (Low-Density Lipoprotein) is a dangerous type of cholesterol particle for the body. A non-pharmacology therapy that could decrease the cholesterol level in the blood is the consumption of Parigi pineapple fruit (*Ananas sp.*). Three primary contents of Parigi pineapple (*Ananas Sp.*): Vitamin C, Niacin, and Myricetin could fix the lipid profile. This quasi-experimental research aims to discover the effect of Parigi pineapple juice consumption on the LDL cholesterol level in the Faculty of Medicine Students, University of Palangka Raya.

Methods: The design is one group pre-test and post-test with the sample in total of 43 male and female students from batch 2020 Faculty of Medicine, University of Palangka Raya, selected through convenience sampling. The tools are Cobas C111, centrifuge cholesterol-checking devices, and juice-making tools such as knife, scales, measuring cylinder, blender, glass, and gloves.

Results: After the consumption of Parigi pineapple juice (*Ananas Sp.*) for 6 days with the dose of 142 gr/70 kg, the data were calculated using the Wilcoxon test with $\alpha = 0,05$ and $p = 0,000$. The average LDL cholesterol level dwindled from 118,7 mg/dl to 102,53 mg/dl.

Conclusion: The treatment could be developed as non-pharmacology therapy since it is proven capable to decrease LDL cholesterol level.

KEYWORDS

Parigi Pineapple, Hypercholesterolemia, Low-Density Lipoprotein.

INTRODUCTION

Hypercholesterolemia is one of the risk factors of coronary heart disease. Based on National Basic Health Research (Riskesmas) in 2018, 36 million or approximately 18% of Indonesian citizen have hypercholesterolemia¹. The data prevalence on the proportion of total cholesterol levels of Indonesian citizen indicates that the age group 15-24 years old have hypercholesterolemia by 7.2%, age group 25-34 by 14.7%, and age group 35-44 by 20,6%². The secondary data, result of the previous study obtained from Health Services of Kalimantan Tengah Province in 2020, indicated that hypercholesterolemia ranked 55th. On the other hand, Malik et al., revealed that 8 out of 31 medical students batch 2011 in Sam Ratulangi University Manado have hypercholesterolemia with the level up to 200-239 mg/dL (25,80%)³.

High cholesterol affects approximately 15% teenager. The symptom of the cholesterol on teenager sometime is not recognized and tends to be ignored³. It is a concern especially on medical student that stay at home for too long during Covid-19 lock down. Gracia Natasia conducted research⁴ entitled "Gambaran Kadar Kolesterol Total Pada Mahasiswa Overweight dan Obesitas di Fakultas Kedokteran Universitas Sumatera Utara." that described the concerning cholesterol levels on obese (32.4%) and overweight

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(12.7%) medical students because of unhealthy lifestyle such as consuming fastfood.

Another study by Isra Thristy et. al.⁵ entitled "*Gambaran Tingkat Stres dan Kadar HDL Kolesterol Darah Pada Mahasiswa Fakultas Kedokteran.*" showed that 54.2% sample have high total cholesterol level because of increased stress. The increased stress triggers a significant rise of cortisol hormone, adrenaline, total cholesterol, LDL cholesterol and reduction of HDL cholesterol⁵.

Lifestyle adjustment is required to control the cholesterol level through routine exercise, regulated diet, quit smoking, and stress reduction⁶. In addition, therapies that could be given to help decreasing the cholesterol in the blood are pharmacology and non-pharmacology therapy. The non-pharmacology therapy can be done by consuming Parigi pineapple fruit (*Ananas sp.*) which is a local pineapple from South Borneo regency, Kalimantan Tengah or Central Borneo. It contains three primary contents that could fix the lipid profile named vitamin C, Niacin, and Myricetin. Vitamin C fixes the lipid profile by forming bile through extrahepatic cholesterol excretion. Niacin has antidyslipidemia effect that block the fat transfer to the liver hence reducing triglycerides synthesis. Myricetin is one of flavonoids that changes the cholesterol absorption, formation and secretion of triglyceride, and plasma lipoproteins processing⁷.

To Identification or Determination Parigi pineapple fruit from South of Barito we sent this sample fruit to National

Research and Innovation Agency. Determination show Nanas Parigi from family with species *Ananas comosus* (L.) Merr and family Bromeliaceae

Based on the phenomena and the alternative therapy derived from local varieties, as well as the supporting theories, the researcher was interested in conducting research about the effect of Parigi pineapple (*Ananas sp.*) juice consumption on LDI Cholesterol Level in Students of Medical Faculty, University of Palangka Raya.

MATERIALS AND METHODS

Materials

The tools used are 3cc syringe, alcohol swab, knife, fruit scales, measuring cylinder, blender, glass, and gloves. The ingredient is Parigi pineapple fruit (*Ananas sp.*) as much as 142 grams/70kgBB/respondent. The fruit was from Pararapak village, Dusun Selatan, Barito Selatan regency, Kalimantan Tengah province.

Approximately 3cc of vena blood sample was taken for standardized laboratory examination.

The instrument for the data retrieval in this research was observation form. It was filled in by the researcher based on the observations and direct measurements on the respondents. The observation form contained the respondent's identity, the time of total LDL measurement, and the result of LDL level measurement before and after the treatment.

The form was used to record the respondent's LDL level during the study.

Method

This study is quasi-experimental research with one group pre-test post-test design. This research carried out on one group of subjects with two conditions which is carried out without a comparison group, so that each subject is a control class for himself. In this design, before starting the treatment, the researcher did *pretest* to the test group by measuring initial LDL levels. Furthermore, the test group was given treatment in the form of consuming Parigi Pineapple juice (*pineapple sp.*). After completing the treatment, the researcher did *post test* to the test group in the form of measurement of final LDL levels. The population were male and female students batch 2020 Medical Faculty, University of Palangka Raya with total 140 people. The sampling technique was purposive sampling⁸. The inclusion criteria of this research were: Medical student in University of Palangka Raya batch 2020, 17-25 years old, does not have any comorbidity history, currently have LDL cholesterol >100 mg/dL, and willingly participate. Whereas the exclusion criteria were suddenly sick hence unable to participate, resign from the research, and passed away. The sample size estimation in this study was determined through sampling method, namely convenience sam-

Figure 1. Parigi pineapple (*Ananas sp.*)



pling. The final sample size required in this study was 38 respondents. Data analysis technique was performed in two stages, namely univariate data analysis, where univariate analysis was used to describe LDL before and after being given Parigi pineapple juice and age including frequency, mean value, median, mode and standard deviation, and bivariate data analysis was used to see the relationship between variables.

Data collection procedure

In the procedure of data collection and analysis, the researcher performed the following steps:

- a. The researcher conducted a preliminary study to collect secondary data from the Kalimantan Tengah Provincial Health Office and the Palangkaraya City Health Office.
- b. The researcher conducted a proposal seminar related to the research proposal and conducted an Ethical Presentation at the Faculty of Medicine, Palangkaraya University.
- c. The researcher performed a termination test of Parigi pineapple plants at the Indonesian Institute of Sciences (LIPI) in Cibinong.
- d. The researcher applied for the research permit at the Faculty of Medicine, University of Palangka Raya, which is the site of research.
- e. The researcher examined the LDL levels of 140 students from the 2020 batch, if they meet the inclusion criteria then they would be used as samples and the LDL level values became the Pre-test. The sample required by the researcher was at least 30 respondents.
- f. The researcher conducted information of consent to the prospective respondents. In accordance with the size of the population and sample, which was 30 respondents. The researcher explained the purpose and objectives of the research and explained clearly the research schedule, research materials, research location and side effects of the research, it was also informed that the first step to be done was measuring the weight of the respondents, then LDL measurement (pretest) followed one day before the treatment was given.
- g. Of the 30 respondents, they were divided into 2 sessions, namely the first week session and the second week session. Each session consisted of 15 respondents. On the 6 days of treatment, respondents consumed Parigi Pineapple (*Ananas sp.*) juice as much as 142 g/70 kg in the morning after eating between 07.00-09.00 WIB at each respondent's home. After the prospective respondents understand, the researcher gave informed consent to the prospective respondents to ask for their permission as research subjects.

- h. After 6 days of treatment, each respondent was measured for LDL again (posttest). The research time was adopted from the previous research.

Processing of Parigi Pineapple (*Ananas sp.*) Juice

Parigi Pineapple (*Ananas sp.*) fruit was obtained from Parigi area, Dusun Selatan Subdistrict, Barito Selatan Regency. The fruit taken was ripe fruit with bright yellow color. Before using the fruit, the fruit was washed first with warm water. Next, the fruit was cut into small pieces using a clean and sterile knife to ease weighing and refining process. The skin and bracts of the fruit were disposed, but not the pulp. The cut fruit will be weighed to reach 142 grams/70 kgBW or according to the respondent's body weight, then the fruit was blended and the juice was poured into a clean plastic glass, ready to be given to the respondents.

Measurement of LDL Cholesterol Levels

The tools and materials have been prepared beforehand. The tools were 3 cc syringes, alcohol swabs, latex gloves and a form to check LDL levels. The material being examined was venous blood. Next, the examiner washed their hands before measuring the total LDL level of the respondent. Before being checked for LDL levels, respondents were asked to fast so they would be examined on an empty stomach. The respondents were in a sitting position during the measurement.

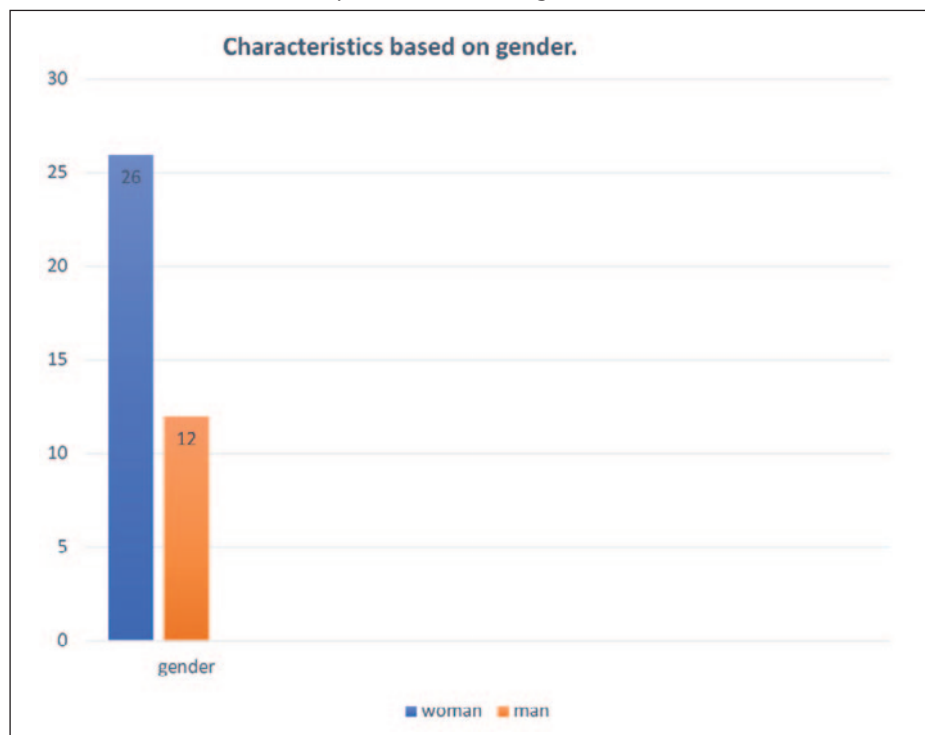
The blood vessel for blood samples was positioned facing the examiner, then confirmed and cleaned using an alcohol swab. After that, pressure was applied above the blood vessel from which the blood sample would be taken to make the vein visible. Next, the venous blood sample is taken using a sterile 3 cc syringe and stored into a blood tube container. Next, the samples were sent to the laboratory where the LDL level examination was performed.

The results were recorded in the form. Then, the researcher tidied up the examination tools, materials, and washed the hands.

RESULTS

This study was conducted on students of the Faculty of Medicine, Palangka Raya University, batch 2020, aged 17-25 years in 6 treatments. The research respondents who met the inclusion criteria were 38 people. Each respondent consumed Parigi Pineapple (*Ananas sp.*) fruit as much as 142 grams/70 kgBW which processed into juice. Each respondent was measured for LDL levels on August 27, 2022 before the treatment was done and on September 10, 2022 after the treatment was done. The data from this study were presented in the form of tables and diagrams.

Picture 1. Characteristics of respondents based on gender



Picture 1 shows the characteristics of responses based on gender. Looking at the inclusion and exclusion criteria, the number of research respondents obtained was 38 people with 26 females and 12 males.

Picture 2 shows the characteristics of the respondents based on their age. 9 students are 19 years old, 19 are 20 years old, 9 are 21 years old, and 1 student is 23 years years old. The respondents of this study came from students of the Faculty of Medicine, Palangka Raya University, Batch 2020.

The results of the LDL-cholesterol examination of the respondents before the treatment (pre-test) and after the treatment (post-test) can be seen from table 1.

The results of the LDL-cholesterol examination obtained from 38 re-

Picture 2. Characteristics of the respondents based on age

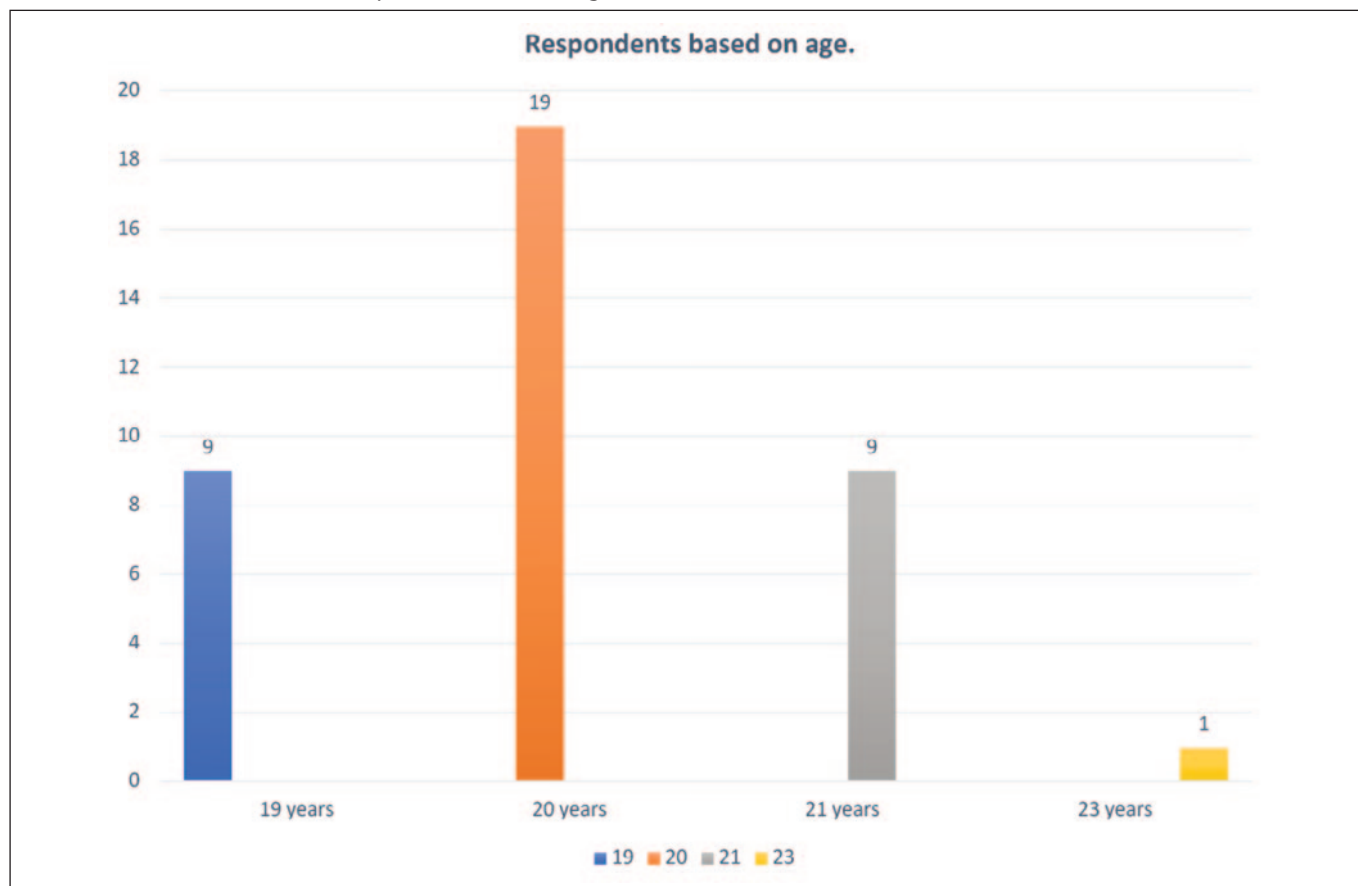


Table 1. Mean Values of LDL-Cholesterol Levels Before (Pre-Test) and After (Post-Test) Treatment

	Mean Values of LDL Cholesterol (mg/dl)	
	Pre-Test	Post- Test
Cholesterol LDL (mg/dl)	118,7 mg/dl	102,53 mg/dl

spondents before treatment were summed up and then divided by the total number of respondents to obtain the average picture of LDL cholesterol results before treatment. The mean LDL-cholesterol level before treatment was 118.7 mg/dl. The same calculation method was also used to obtain the mean LDL-cholesterol level after treatment, and it was found that the mean LDL-cholesterol level after treatment was 102.53 mg/dl. The difference in mean LDL cholesterol levels before and after treatment was 16.17 mg/dl.

. In this study, we did not look at gender because the number of male and female samples differed. To determine whether there is a difference in the mean of two paired samples, the Wilcoxon test was used because the data were not normally distributed.

The results of the Wilcoxon test analysis can be seen in table 2. Based on table 5.4, it can be seen that the p-value is 0.000, because 0.000 is smaller <0.05, it can be concluded that H₀ is accepted. This means that there is a difference between LDL levels for pre-test and post-test, so it can be concluded that statistically giving Parigi Pineapple (*Ananas sp.*) juice can lower LDL levels in students of the Faculty of Medicine, University of Palangka Raya.

DISCUSSION

The population in this study was 140 students of the Faculty of Medicine, University of Palangka Raya, Batch 2020. Based on the inclusion and exclusion criteria in this study, the sample of 38 respondents was obtained. The respondents of this study consisted of 26 females and 12 males, with the most respondents being 20 years old.

This study was conducted for 1 week. Respondents were given Parigi Pineapple (*Ananas sp.*) fruit juice. LDL cholesterol level measurements were performed before the treatment began (H₀) and after the treatment was concluded on day 6 (H₆). The results of the LDL-cholesterol examination of the respondents before treatment showed a mean of 118.7 mg/dl and the mean LDL-cholesterol result after receiving treatment was 102.53 mg/dl. The Average LDL from male respondents before treatment is 122,3, and average LDL from female 117,1. After the they given Parigi Pineapple fruit juice average LDL form male and female are 107,7 and 100,2.

The decrease in LDL cholesterol levels after the treatment for 6 days indicated that the Parigi pineapple juice was able to lower the LDL cholesterol levels of the respondents with a difference in the decrease result of 16.17 mg/dl. Furthermore, this result then fortified by performing data analysis using statistical tests. The results of the statistical test supported that Parigi Pineapple (*Ananas sp.*) juice consumption can lower LDL cholesterol levels where $p=0.000$.

Public health in general is particularly important. Currently, there is a shift in lifestyle and dietary habits such as switching from consuming traditional food to ready-to-eat food such as fast food and junk food. Ready-to-eat food holds high glucose, fat, sodium content which causes people who consume such food and drinks to easily experience obesity or other metabolic conditions⁹.

High cholesterol levels in the body due to foods consumption could raise cholesterol levels, thus narrows and hardens the blood vessels or atherosclerosis⁹. In plasma, free cholesterol and cholesterol esters are transported by lipoproteins. Four main groups of lipoproteins are chylomicrons, Very Low-Density Lipoprotein (VLDL), Low Density Lipoprotein (LDL), and High-Density Lipoprotein (HDL). Each type of lipoprotein has a different function and disposed by the body in a different way. Increased levels of non-HDL lipids can cause narrowing of blood vessels¹⁰.

One form of non-HDL lipid, namely Low-Density Lipoprotein (LDL), is currently being widely studied as a predictive value in CHD. because of its role in the atherogenesis process. LDL

Table 2. Results of Wilcoxon Signed Rank Test Analysis

Wilcoxon Signed Rank Test					
		N	Mean Rank	Sum of Ranks	p-value
Pre-test dan Post-Test Total cholesterol	Negative Ranks	36	18,92	681,00	0,000
	Positive Ranks	2	30,00	60,00	
	Ties	0			
	Total	38			

is also called atherogenic lipoprotein because it easily sticks to blood vessels. Whereas HDL is a lipoprotein that functions to balance excess LDL levels. HDL is responsible for taking excess cholesterol in the periphery and bringing it back to the liver to be destroyed. Changes in the ratio of LDL and HDL also play a very important role in the pathogenesis of CHD. Therefore, management of LDL and HDL cholesterol levels is needed to avoid CHD events¹¹. Cholesterol will be transported in the form of LDL. Oxidation of LDL in the subendothelial layer of arteries will cause various inflammatory reactions, which eventually attract monocytes and neutrophils to the lesion area. These white blood cells will adhere to the endothelial layer by adhesive molecules, and release other inflammatory mediators that attract more white blood cells to the lesion area and further stimulate LDL oxidation. Then, monocytes move into the arterial wall which is where monocytes mature into macrophages and convert LDL into foam cells (This will trigger plaque accumulation in blood vessels. As a result of plaque accumulation, narrowing of the lumen will occur which will then cause ischemia, such as in CHD¹²).

Empirically, medicinal plants have been widely used by the community as traditional medicine for generations. One of them is pineapple, which contains bromelain enzyme, vitamin C and high fiber which can be used as an alternative treatment that can reduce cholesterol levels and prevent hypercholesterolemia. Pineapple contains vitamin C which plays a role in cholesterol metabolism by increasing the rate of cholesterol that is disposed of in the form of bile acids that are excreted through the small intestine, increasing HDL levels, and also acting as a laxative to increase defecation. In addition, pineapple also contains bromelain enzyme that can help lower cholesterol levels by breaking down fat in the intestines and digestive tract. The high fiber content in pineapple can help lower cholesterol by shortening the transit time of food through the digestive tract, increasing bile production and eliminating it into the intestine to be secreted as feces. This is what lowers cholesterol reabsorption and converts it into bile acids¹³⁻¹⁵.

Parigi Pineapple (*Ananas sp.*) used in this study is a pineapple fruit that comes from Barito Selatan Regency in the Dusun Selatan sub-district. The purpose behind the selection of Parigi Pineapple in this study is to emphasize the potential of medicinal plants in Kalimantan Tengah. Since there are various varieties of pineapple fruits in Kalimantan Tengah, the researcher aims to know whether the content of Parigi Pineapple has different potential and phytochemical content compared to previous studies which using pineapple fruit varieties from different places.

From the phytochemical test on the content of Parigi Pineapple (*Ananas sp.*) which was conducted in the Biochemistry Laboratory of the Faculty of Medicine, Lambung Mangkurat University with the spectrophotometry method, only 2 compounds were obtained, namely vitamin C and

flavonoids. The limitation of the compounds obtained is because only two compounds could be examined in the Biochemistry Laboratory of the Faculty of Medicine, Lambung Mangkurat University. In general, pineapple fruit has Flavonoid compounds, vitamin C, bromelain enzyme, Niacin, Myricetin and Polyphenol. The compounds possessed by pineapple fruit are considered capable of lowering cholesterol levels. Myricetin can alter liver absorption, assembly and secretion of triglycerides, and plasma processing to improve lipid levels. Polyphenols can also improve lipid levels by increasing Paroxanase enzyme which will increase HDL levels. Vitamin C and niacin can also improve lipid profile by forming bile fluid through excretion of extra hepatic cholesterol, in addition to cholesterol metabolism by increasing the rate of cholesterol that is disposed of in the form of bile acids that are excreted through the small intestine, increasing HDL levels. Whereas niacin, at high doses can inhibit fat transport to the liver which will reduce triglyceride synthesis⁷⁻¹⁴.

The research on the utilization of plants and fruits, especially Parigi Pineapple which is only found in Barito Selatan Regency, Central Kalimantan, is expected to provide benefits for the wider community about the potential health benefits. Additionally, pineapple fruit is cheap and easy to consume in daily basis.

CONCLUSION

The conclusion is that the average characteristics of LDL cholesterol levels in medical students of Palangka Raya University before Parigi pineapple juice consumption are 118.7 mg/dl and after the consumption are 102.53 mg/dl. The results of statistical analysis of the study showed that there was an effect of giving Parigi pineapple juice (*Ananas sp.*) on lowering LDL cholesterol levels in medical students of Palangka Raya University.

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